FSMIP FINAL REPORT

MARKET IMPROVEMENT FOR NORTHERN SOYBEANS THROUGH DIRECT MARKETING 12-25-G-0367

JANUARY 2005

EXECUTIVE SUMMARY

Recent research indicates that northern soybeans may have better amino acid profiles for poultry rations. With the assistance of this FSMIP grant, University of Minnesota researchers have documented that samples from 2002 Minnesota soybean crops had approximately 30% higher total sulfur containing amino acids which are essential for poultry diet than those from Mississippi and North Carolina.

A registered brand name, Norsoy™ has been used to promote this quality feature of northern soybeans in the targeted markets of China and Mexico. Promotional materials have been developed. Nutritional seminar and trade show exhibits have been held in those markets. A 25 rail car test sale of Norsoy™ has been made to Mexico. Norsoy™ concept has been met with great enthusiasm from both markets for its additional nutritional benefits as well as its direct marketing from soybean producers.

The direct beneficiaries of Norsoy™' poultry operators and poultry feed manufactures. However, purchasers of US soybeans from these markets are typically oil crushers. In order to further the market development of northern soybeans, feeding trials may be instrumental to demonstrate the advantages of Norsoy™ with combined efforts from crushers, feed manufacturers, poultry farmers and local university researchers.

Further activities planned in the near future include buyer missions to the United States to further promote Norsoy™ and to familiarize buyers with trade logistics; more exhibits and nutritional information exchanges in Mexico and China; and possibly a feeding trial in Mexico.

SUBMITTED BY

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1. Introduction

Soybean is one of the largest cash crops in the United States. Minnesota is a significant part of that crop production. According to USDA statistics, Minnesota ranks third in the nation with 7.2 million acres or 309 million bushels of production after Iowa (10.4 million acres or 495 million bushels) and Illinois (10.6 million acres or 450 million bushels).

Table 1. Soybean Price Paid to Farmers by Regions and States*

		Production million bu	Price $/bu	Wt'ed Average		Production million bu	Price $/bu	Wt'ed Average
Northern States	Michigan	78	5.50					
	Minnesota	309	5.25		**Mid States**			
	New York	4	5.55		Delaware	5	5.70	
	N. Dakota	87	5.20	5.26	Illinois	450	5.50	
	S. Dakota	127	5.15		Indiana	236	5.40	
	Wisconsin	67	5.25		Iowa	495	5.40	
Southern States	Alabama	4	5.35		Kansas	58	5.40	
	Arkansas	96	5.65		Kentucky	41	5.75	
	Florida	0.2	5.35		Maryland	11	5.75	5.44
	Georgia	3	5.35		Missouri	170	5.40	
	Louisiana	21	5.55		Nebraska	176	5.35	
	Mississippi	44	5.55	5.58	New Jersey	2	5.50	
	N. Carolina	30	5.50		Ohio	141	5.45	
	Oklahoma	7	5.40		Pennsylvania	9	5.70	
	S. Carolina	7	5.40		Virginia	10	5.45	
	Tennessee	35	5.70					
	Texas	6	5.20					

*Data source: USDA Statistics

Table 1 indicates the total soybean production and prices paid to farmers by regions and by states for the production year 2002. Prices farmers receive not only vary from state to state, but there is also a general trend that northern farmers receive less per bushel of beans than their southern counterparts.

While prices for soybeans may depend on a number of factors--chief among them are location with regard to cost of transportation to major markets, quality of beans, etc.--it is generally believed that northern beans are discounted due to insignificant lower protein content. Northern beans most commonly are 1 to 2% lower in protein. Most soybean buyers price their beans by oil and protein contents. As a result, northern beans are discounted on protein content alone by about $0.10/bushel. With a total production of 644 million bushels in the northern states of Michigan, Minnesota, New York, North Dakota, South Dakota and Wisconsin, that discount amounts to some 60 million dollars.

A recent study has suggested that this lower protein may not justify the discount if the soy protein is fed to the right animals. Dr. Charles Hurburgh of Iowa State University reported that certain amino acids that are critical to poultry may not decline as protein content decreases in certain soybeans (Hurburgh 2001). In a chart he released in 2000 (Figure 1), methionine and cysteine levels seem to have stayed constant as protein levels changed from 25% to 48%.

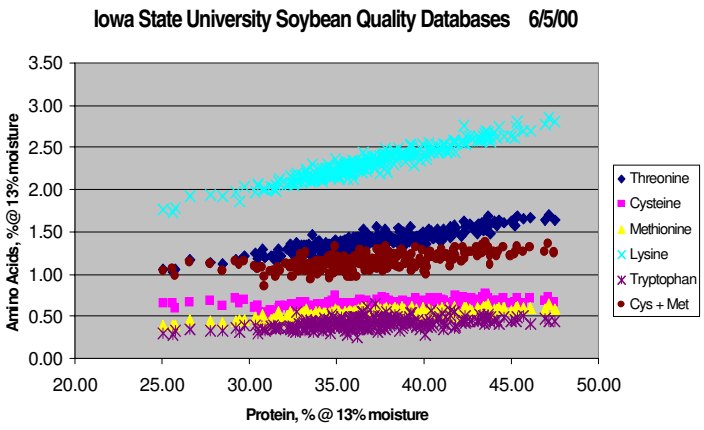

Figure 1. Relative constant amino acid levels in soybeans of varying protein content

It is a well-known fact in poultry nutrition that methionine and cysteine are the most limiting amino acids in poultry feed. Poultry feed manufacturers make up the deficiency by either putting excess protein in their feed or by supplementing synthetic amino acids in their rations. Adding synthetic amino acids is not only a costly proposition but also constitutes an environmental burden. When feedstuff with amino acid profiles are different from the nutritional requirements of the animals being fed, the excess protein, which is ultimately digested into amino acids, ends up in waste in the form of urea. Most poultry farms in the United States these days come under stringent environmental regulations for their discharge of waste nitrogen.

There is very little published data addressing the differences in amino acid composition between northern and southern soybeans since this is a relatively new discovery. However, there have been research papers with amino acid profile data published. While these papers may have addressed other issues, the data published may bring to light information that favors the theory that northern soybeans have a better amino acid profile for poultry because of their higher methionine and cysteine content. Zakardas et al (1997a and 1997b) and Zakardas et al (1999) analyzed amino acid content of about 20 northern soybean samples, new variety or otherwise. Figure 2 shows the averaged data published in the three papers and compares them to the average amino acid levels as

published by the National Research Council (1994), a commonly accepted source and authority on nutrient contents of commonly available feed ingredients. On the average, the Zarkadas papers showed that methionine and cysteine concentrations in total protein could be at least 40% higher than the commonly accepted NCR levels. Aside from the

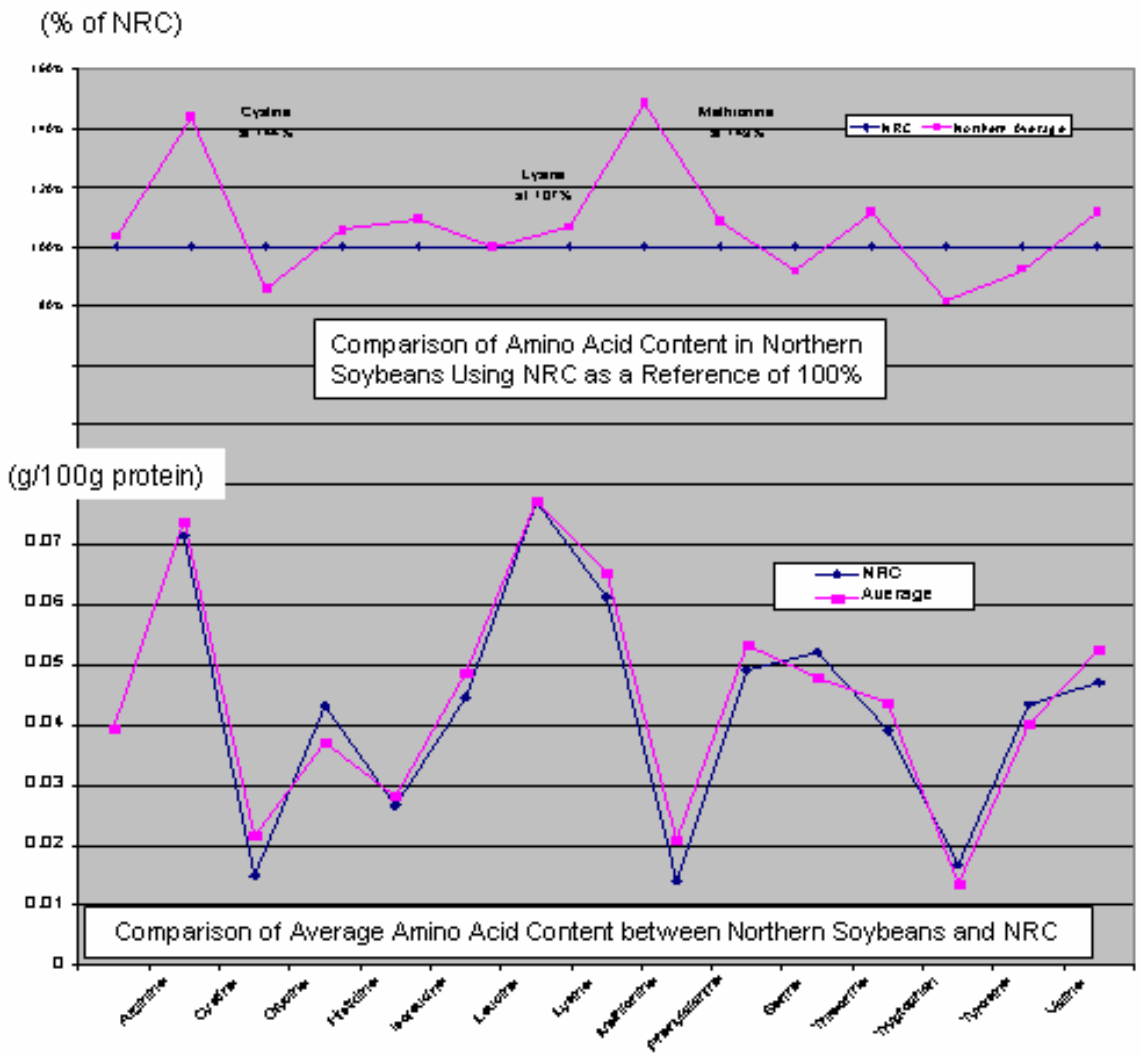

Figure 2. Amino Acid Content of Average 20 Northern Soybean Samples and their Comparison to NRC Data

intrinsic values of these amino acids being of biological origin, the cost of adding synthetic amino acids to make up the deficiency in poultry feed should well offset the lower protein in northern soybeans. The higher concentrations of methionine and cysteine should be well over $0.10 per bushel.

In addition to low soybean prices at the market place, it is also recognized in Minnesota and nationwide in general that agricultural globalization is changing the way farmers need to do business. More and more farmers are realizing that a transition from production-oriented farming to a market-oriented production strategy is necessary. Farmers or farmer-based groups have to learn of market needs and have to own their own customers. This means, among other things, that direct marketing will be a necessity.

The U.S. soybean industry, regardless of northern or southern, is facing increasing competition from South America. Production expansion in Brazil and Argentina is taking place much more rapidly than previously expected. USDA FAS projected in 1999 that the production for Brazil and Argentina for 2003 would be 34.5 and 18 metric tons, respectively (Douvelis 1999). However, the forecasts in January and February 2003 estimated 2002/2003 soybean production for Brazil and Argentina at 51.0 and 35 million metric tons, respectively (Ash and Dohlman 2003a and Ash and Dohlman 2003b).

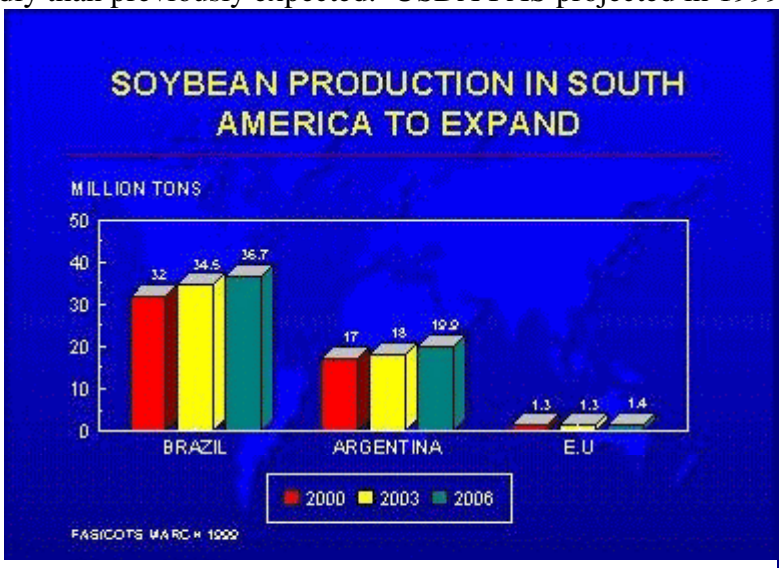

Figure 3. 1999 Projection of South America Soybean Expansion

Soybean prices for March 2003 delivery from the U.S. Gulf are about 30 cents per bushel higher than export quotes from Brazil (Ash and Dohlman 2003b). The U.S. delivered price to Japan including freight costs is about 10 cents higher than Brazil's. It is generally agreed that we cannot compete with South America on price alone. We have to distinguish U.S. beans by promoting the quality they possess. Quality and identity are going to be important in the future promotion and marketing of U.S. soybeans.

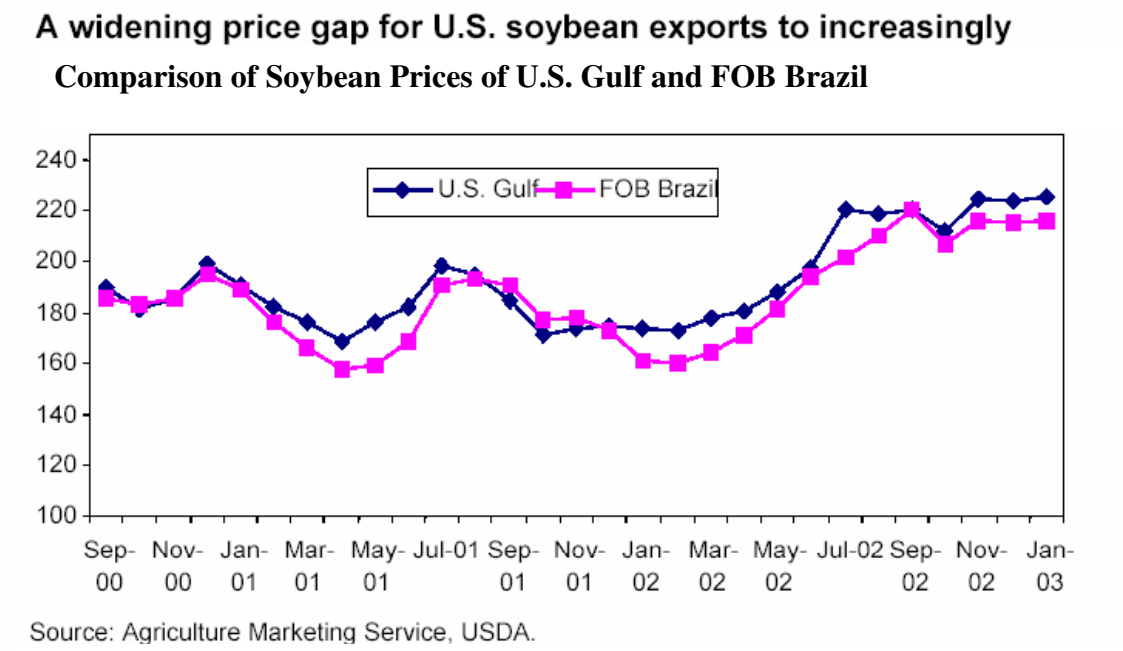

Figure 4. Widening Gap of Prices between U.S. Gulf and FOB Brazil Soybeans

However, the current commodity mechanism is not conducive to the promotion of quality and the establishment of identity. Commodity trading, while very efficient in logistics handling, is trading product quality based on the lowest common denominators. Producers and/or suppliers don't strive for excellence in quality as in countless other industries, but instead eye for meeting the lowest specifications such as in #2 soybeans. What is lost in this trade is users of commodities cannot call on specifications that best meet their needs, but rather can only design their needs based on what is available. On the other hand, when farmers and/or elevators have high quality products they are not duly compensated; instead foreign matters are frequently blended to lower the quality to the minimum acceptable levels.

It is necessary to break this practice in quality management and establish new ways of marketing that will enable us to better promote U.S. quality and better satisfy market needs. Direct marketing provides the means to break the mold. The significance of this project is in its attempt to establish direct marketing through product identity and quality management for a major market segment, the selected poultry feed market, as opposed to niche marketing. Identity preservation and direct marketing are not new, but most efforts for Identity Preserved are focused on niche markets as opposed to major markets such as poultry feed.

Based on the scientific findings and the need for direct marketing and/or identity preservation, the Minnesota Department of Agriculture developed the trademark Norsoy™. Norsoy™ is modeled after another successful trademark we have, Minnesota Grown™, which, in contrast to the profit motives of most trademarks, is purely for the promotion of locally grown high quality fruits and vegetables. In addition to the more desirable amino acid profiles for poultry feed, Norsoy™ will also take the attributes of known and guaranteed product quality specifications. This project is primarily focused on using Norsoy™ as a tool to promote northern soybeans in our attempt to find customers who will be in direct contact with our farmers.

In recognition of the global agricultural transformation and the need for direct marketing of Minnesota agricultural products, the Minnesota Legislature directed the creation of the Minnesota Shippers Association (MSA). One of the mandates for the association, among others, is direct marketing. This project is a joint effort between the Minnesota Department of Agriculture and the Minnesota Shipper's Association.

2. Project Report:

The goals of this project are to increase the competitiveness of northern soybeans by targeting the poultry feed market worldwide. This goal may be achieved by creating value for the poultry industry through increased feed efficiency and reduced cost.

2.1. Objective 1: Documentation of Northern Soybean Quality.

We are pursuing information on amino acid profiles of soybeans from both the University of Minnesota and the University of Iowa. We contracted with the University of

Minnesota to provide a summary of the research progress on comparison of amino acid profile of soybeans from Minnesota as northern samples and from Mississippi and North Carolina for samples from the south. .

We also gathered information from Iowa State University with the assistance of the American Soybean Association. Mr. Jim Palmer, Director of Minnesota Soybean Association, has been instrumental in getting the communications channels cleared.

2.1.1. Objective 1a: Documentation of summary results of research on soybean amino acid profiles and application of NIR technology on farm or on elevator site.

In order to establish and/or assess the amino acid profile, it was necessary to start from a known and well-established methodology of amino acid analysis. The commonly accepted for this is by high performance liquid chromatography (HPLC). HPLC is an analytical technique capable of separating chemically similar components, such as amino acids by gradient columns. A computerized integrator quantifies the quantity of amino acid separated. This quantification is then compared to a known standard to determine the actual quantity of a given amino acid (Hamilton and Sewell, 1982; Szepesi, 1992). The advantage of HPLC analysis is that it is reliable and the results are commonly accepted. The disadvantage is it is costly and time consuming. It is not suited for usage in real time trade situations because of the cost and time consumption, as a result it has not been used in trade to date.

Near infrared reflectance spectroscopy (NIRS) has been used for more than 30 years. It was introduced into the grain industry in 1971 as a means of rapid analysis for oil, protein and moisture (Helms and Orf, 1998; Williams, 1975). NIRS operates by shining light on the sample material; the light that is reflected is then picked up by detectors. The spectral data produced represents the total chemical and physical composition of the sample (Shenk and Westerhaus, 1991; Kempen, 1996). Interpretation of the spectral information is complex and must be related to some known analytical laboratory value (for example high performance liquid chromatography (HPLC)). Analytical laboratory values are required in order to produce a NIRS library file, which is used for the development of calibration prediction equations. The calibration equation is then used for the conversion of NIRS spectral information into predicted values, for trait(s) of interest (Shenk and Westerhaus, 1991), in this case, for prediction of amino acid levels of any given sample.

One hundred eighty three samples from soybeans grown by Minnesota farmers, 44 samples by farmers in North Carolina (collected by Cargill) and 96 samples from soybeans grown on research plots by the Agronomy production project at Mississippi State University were collected for amino acid analysis. The whole seed samples were ground using a Knifetec grinder and scanned on a Model 6500 NIR machine.

The equations used to predict the protein and amino acid values of the samples were created from a previous equation (Pazdernik et al., 1997) and from samples from 2000, 2001, and 2002 that were selected for spectral differences. The selected samples were then analyzed for amino acids using a HPLC procedure at the University of Minnesota, the analytical laboratories at the University of Missouri and at the University of Guelph.

Both University of Missouri and University of Guelph offer commercial services for amino acid analysis. Multiple laboratories are used to validate the amino acid analysis. The laboratory results were used to improve the initial NIR equation. Table 2 below provides the equation statistics. One critical parameter is the RSQ (R Square), which indicates how closely the HPLC results and the NIRS predictions correlate with each other. In general, a RSQ of 0.8 or better is considered a close correlation. R Square for methionine and cysteine are 0.8776 and 0.953 respectively.

Table 2. NIRS Equation Statistics.

Constituent	N	Mean	Est. Min.	Est. Max.	SEC	RSQ	SECV	1-VR
Aspartic acid	554	11.5266	5.8844	17.1688	0.545	0.916	0.583	0.9038
Serine	562	5.8612	1.9946	9.7279	0.3747	0.9155	0.4154	0.896
Threonine	560	4.382	2.3764	6.3876	0.2555	0.8539	0.274	0.8318
Proline	564	5.5787	3.7013	7.4561	0.3035	0.7648	0.3166	0.7438
Arginine	538	7.7754	6.3355	9.2153	0.2959	0.6199	0.3231	0.5482
Methionine	334	1.7036	0	3.7858	0.2428	0.8776	0.2643	0.8546
Isoleucine	571	4.8609	2.6634	7.0583	0.2906	0.8426	0.3139	0.8162
Histadine	538	3.0439	1.5842	4.5036	0.2771	0.6756	0.2879	0.6495
Tryptophan	67	1.017	0.5555	1.4786	0.1461	0.0979	0.1539	0.0092
Protein	312	41.4419	31.7403	51.1436	0.5155	0.9746	0.6098	0.9644
Cysteine	308	1.2642	0	3.9704	0.1955	0.953	0.2174	0.9417
Glutamic acid	551	16.839	4.155	29.5229	0.9029	0.9544	0.9774	0.9465
Glycine	545	5.5826	0	11.9001	0.4858	0.9468	0.5336	0.9357
Alanine	539	4.7981	2.5588	7.0374	0.2039	0.9254	0.2232	0.9105
Valine	553	5.5195	2.3673	8.6717	0.2637	0.937	0.2817	0.9281
Leucine	557	7.2446	2.9538	11.5355	0.4096	0.918	0.4489	0.9014
Phenylalanine	531	5.1291	3.3225	6.9356	0.3319	0.6962	0.3653	0.6317
Lysine	548	6.0396	2.5698	9.5094	0.3913	0.8855	0.4188	0.8687
Tyrosine	548	3.895	1.7179	6.072	0.2854	0.8454	0.3063	0.8216

This new NIR equation was then used to predict the amino acid composition of the soybean samples based on the spectral scans. The amino acids were predicted as a percent of the total protein on a dry matter basis.

Statistical analysis indicates that there are significant differences in the methionine and cysteine content among Minnesota, Mississippi and North Carolina samples. Table 4 summarizes the results of statistical analysis. Methionine levels are similar in all Minnesota, Mississippi and North Carolina samples at 1.45%, 1.52% and 1.48% respectively. Minnesota soybeans seem significantly higher in Cysteine concentrations at 1.50% of total protein vs 0.61% and 0.69% of total protein for Mississippi and North Carolina respectively. Since both methionine and cysteine are sulfur containing amino acids, their contents are somewhat related with each other. The meaningful measurement is the combination of methionine and cysteine, the so called total sulfur containing amino acids (Coon, 2004). Total sulfur containing amino acid levels are significantly different between Minnesota and Mississippi samples and between Minnesota and North Carolina

Table 3. Protein and Amino Acid Values from 2002. Protein is expressed on a 0% moisture basis and the amino acids are expressed on per cent of protein.

		Minnesota			North Carolina			Mississippi		
Constituent	Soy-bean Meal	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.
Protein	49.0	40.09	36.44	42.14	39.46	37.91	40.50	42.77	40.31	47.60
Arginine	7.6	7.44	7.01	7.79	7.51	7.13	7.88	7.88	7.16	8.47
Cysteine	1.6	1.50	0.59	2.25	0.69	0.38	1.01	0.61	0.01	1.43
Histadine	2.4	2.98	2.55	4.22	4.13	3.63	4.82	3.47	2.73	3.91
Isoleucine	5.2	4.53	4.10	4.82	4.51	3.79	5.01	4.03	3.50	4.69
Leucine	7.6	7.51	4.24	8.30	4.94	3.41	6.14	4.72	3.32	7.13
Lysine	6.4	6.16	2.92	6.83	4.15	3.17	5.46	3.60	2.08	5.88
Methionine	1.4	1.45	1.36	1.59	1.48	1.44	1.57	1.52	1.40	1.68
Phenylalinine	5.4	5.01	3.80	5.49	4.00	2.70	4.53	3.96	2.83	4.82
Threonine	4.0	4.13	3.68	5.72	5.50	4.78	6.40	5.15	4.37	5.79
Tryptophan	1.2	1.01	0.84	1.14	1.04	1.01	1.08	1.05	0.89	1.11
Valine	5.4	5.30	4.75	7.24	6.91	6.31	7.68	6.76	5.53	8.47
Alanine		4.53	4.06	6.18	6.10	5.24	6.85	6.00	4.94	6.58
Aspartic acid		11.42	10.43	12.10	10.07	9.07	10.86	11.92	10.76	12.82
Glutamic acid		17.75	9.91	20.63	9.88	5.93	13.23	12.16	8.96	16.28
Glycine		5.18	3.40	9.63	9.96	7.08	12.80	8.84	6.11	10.52
Proline		5.31	5.10	6.49	6.35	6.00	6.77	6.21	5.63	6.73
Serine		4.95	4.24	8.36	7.74	6.38	8.60	7.82	5.59	9.17
Tyrosine		3.82	3.44	5.43	5.11	4.44	6.06	4.92	3.87	5.58
Methionine + Cysteine		2.95			2.17			2.13		

samples. It appears that Minnesota soybeans may have 30% higher total sulfur containing amino acids than those from Mississippi and North Carolina.

Although 2002 crop samples do indicate a difference in the combined methionine and cysteine levels between Minnesota and southern (Mississippi and North Carolina) samples, researchers feel that it is very important to accumulate data over the years. The University of Minnesota is continuing to monitor the amino acid content of soybeans over the next two years. They hope to have data for at least 3 crop seasons before any conclusion is made.

Report from Iowa Sate University is consistent with findings from the University of Minnesota. ISU continues its report of advantages of northern soybeans in terms of amino acid profiles for poultry rations. Drs. Brumm and Hurburgh stated in their 2002

Table 4 Amino Acid Contents of Soybeans from 2002 Crop Samples of Minnesota, Mississippi and North Carolina on a Dry Matter Basis

Sample Sources	Methionine	Cysteine	Methionine+Cysteine
Minnesota	1.45	1.50	2.95
Mississippi	1.52	0.61	2.13
North Carolina	1.48	0.69	2.17
MN vs MS	F=0.392, P<0.01	F=0.576, P<0.01	F=0.657, P=0.016
MN vs NC	F=3.23, P<0.01	F=1.60, P=0.070	F=1.67, P=0.049

report (Brumm and Hurburgh 2003) to the United Soybean Board that "for poultry nutrition (sulfur amino acid dependent), the 32% soybeans were actually superior to all others. Therefore, regions that typically produce low protein may not be at the disadvantage now assessed by the market." The regions that typically produce low protein soybeans are generally considered the northern states. However, the actual amino acid content in the same report indicates the contrary. They reported the total sulfur containing amino acids from Minnesota, North Dakota, South Dakota, Michigan and Wisconsin to be 1.06, 1.15, 1.16, 1.12 and 1.13 respectively; while Missouri, Nebraska, Illinois, Indiana and Arkansas to be 1.17, 1.19, 1.16, 1.15, 1.15 respectively. No statistical analysis is given in the report.

The University of Minnesota will continue to measure amino acid contents of 2003 and 2004 crops with the NIR techniques. Amino acid profiles of 2003 soybean crop may be different because of the drought in the summer prior to harvest. We intent to contract with the University of Minnesota again for the FSMIP 2003 grant project for an update for analysis of 2003 and 2004 soybean crops.

Initial results on amino acid analysis of soybean meals from two Minnesota crushing plants, one South Dakota plant and three Georgia plants have been obtained. Preliminary results does not show any significant different between northern and southern soybean meal. However, we are having difficulty in obtaining valid samples from all the designed sites all the time. Amino acid analysis of soybean meal is done by HPLC method.

We are also exploring other technologies of rapid testing of amino acids in addition to working with the University of Minnesota with FOSS NIR technology. QTA Cognis is a Cincinnati, Ohio based company that provide an Internet enabled Fourier Transform NIR (FT-NIR) which is supposedly much simpler, without requiring an lab designed personnel. More and more research seems to be conducted in this area. Dr. Marvin Paulsen just finished a University of Illinois project entitle: "Increase Capability to Measure and Modify Soybean Seed Composition and Functionality in Foods" which also utilized FT-NIR technology.

2.1.2. Objective 1b: Development of protocols/procedures on branded northern soybean quality and quality documentation.

Agriculture may be one of the oldest industries. Yet, most other industries have adopted quality management systems as a necessity. The United States has led the world in developing quality products and procedures. The quality systems developed by our automotive industry in its sourcing of automotive parts, QS9000 for example, have become the standard for the auto industry and many other industries worldwide. A similar but less stringent system, the ISO 9000 standards, has also been developed to provide quality procedures for almost every industry imaginable. These systems provide a template in quality systems management.

A typical quality system consists of a product specification and a quality protocol with procedures, inspections and analysis to guarantee the delivery of the specification. Product specification would describe the features and/or composition of a product. In the case of soybeans, product specification would describe the nutritional composition and physical parameters of the soybean such as the moisture content, foreign matter, etc. Product specification is usually set based on what is desired in the market place and what is practically achievable.

Setting the quality procedures to guarantee the specification may be more difficult. This procedure has to contemplate all factors that could affect the final product and specify limitations within which a product is produced. In an effort to establish a soybean quality management program, a quality workgroup has been formed. The group consists the following members:

Adam Sobieski, Project Manager, Minnesota Shippers Association
Robert Zelinka, Director, Minnesota Grain and Elevator Association and Executive Director, Minnesota Shippers Association
Dr. Jim Orf, Professor, University of Minnesota
Dr. Jerry Shurson, Professor, Animal Nutrition, University of Minnesota
Jim Palmer, Executive Director, Minnesota Soybean Promotion and Research Council
Scott Doubleday, General Manager of Hentley Falls Elevator and Chairman of Minnesota Grain and Elevator Association.
Ricardo Stettner, Director, Jalisco Ag Council, Jalisco, Mexico
Craig Damstrom, Agricultural Trade Consultant, Minnesota Department of Agriculture
Richard Ying Ji, Senior Marketing Specialist, Minnesota Department of Agriculture
Kurt Markham, Marketing Director, Minnesota Department of Agriculture.
Dr. Nick Bajjalieh, President, Interactive Nutrition, Inc.

It was the consensus of the group that need exists for the establishment of a quality program. A complete and ideal product specification for soybeans would have all the amino acid composition and all other nutritional information. However, what the exact composition of any given lot of soybeans depends on many factors. Accurate and expedient analysis of amino acids is still to be desired. There seems to be wide variation in the amino acid composition of soybeans. It is still not clear as to what contributes to

this variation. It is still a question how much or whether or not geographical location and/or climate contribute to this variation.

However, despite these uncertainties, the group still felt that setting specifications and marketing the product for its content, not just as a commodity, was a valid initiative. The group felt that it might be a wise strategy to set the immediate specification somewhere in between the present No. 2 soybean standard and the ideal specification. The market place is such that it is not necessary to have a perfect product, just one that is better than its competition. As the competition catches up, the specification should be improved.

Table 2 lists specifications for 4 different grades of commonly traded soybeans. There are at least two problems with this grade specification. One is that this specification is far from being specific enough. Most nutrient values are not included in the spec; even protein and oil values are omitted. The second problem is that it offers too few options. Most of our soybeans are between No. 1 and No. 2. More options are needed to reflect the actual trade.

Although the Federal Grain Inspection Service (FGIS) provides a tremendous value in monitoring the quality of grain exported and provide much needed confidence by international grain buyers by performing sampling of all grains at loading sites, the international market is increasingly unhappy with the common practices of blending to meet the lowest standards of contracted specifications.

Table 2. Specifications of Soybean Grades

Test Grade	Min Weight	Maximum Percentage of					
		Moisture	Splits	Damaged Kernels		Foreign Materials	Off Color
No. 1	56.0	13.0	10.0	0.2	2.0	1.0	1.0
No. 2	54.0	14.0	20.0	0.5	3.0	2.0	2.0
No. 3	52.0	16.0	30.0	1.0	5.0	3.0	5.0
No. 4	49.0	18.0	40.0	3.0	8.0	5.0	10.0

Development of quality work was suspended and/or terminated due to two major reasons: 1) NIR measurement of amino acid is not ready for field deployment yet. It is not practical to write a quality protocol calling for amino acid analysis with NIR technology. This, however, may occur in the next 3 or so years. 2) There is a major market hurdle for soybeans in terms of component marketing internationally at amino acid level. Soy crushers are soybean purchasers. Their objective is to put out soy oil and soybean meal. Poultry feed manufactures who are customers of soy crushers are the beneficiaries of better amino acid composition in the soybeans. They tend not to value soybeans based on their amino acid composition. A push needs to be initiated by the poultry feed manufacturers to the crushers for soybeans with better amino acid composition. Quality procedures need to be created with the input and demand of customers.

A generic licensing of Norsoy™ brand to individual companies may still be a worth a while to pursue. Arrangement can be made for a joint effort between companies and government effort to ensure product quality and brand name recognition.

2.1.3. Objective 1c: Educational seminars on quality documentation and participation of branded northern soybean marketing program and direct marketing.

Norsoy™ concept and promotional materials have been developed and promoted to Minnesota and Dakota farmers. Minnesota Shippers Association developed a tabletop display with a combination of MSA and Norsoy™ information. This display has been exhibited at various farmer-oriented shows and conferences to promote the concept and the awareness of the Norsoy program and the FSMIP sponsored project. Flyers have been handed out at these tradeshows. The following are events that have been attended:

Figure 6. Exhibit at the North Dakota Soybean Growers Association Soybeans Expo

Willmar Ag Conference
Minnesota Farm Bureau Show
Minnesota Soybean Growers Association Soybean Expo
Minnesota Wheat Growers Prairie Grains Conference & Expo
Minnesota Ag Expo
Minnesota Crop Improvement Association Conference
Minnesota Organic & Grazing Conference
Fergus Falls West Otter Tail Crop Show
Minnesota Grain and Feed Association Trade Show
Minnesota Soybean Growers Association Trade Show

2.2. Objective 2: Direct Marketing of Northern Soybeans to Poultry Concerns in Selected Markets.

2.2.1. Objective 2a: Content development of marketing materials.

We have designed a fact sheet and a popup display banner for Norsoy™ information. This fact sheet has been distributed at the Tokyo ASA 2003 Japan Show, the US Grains Conference in Minneapolis, the Minnesota Soybean Quality Conference in Willmar, MN, the 2003 China Animal Husbandry and Feed Industry Trade Fair, 2004 China Animal Husbandry and Feed Industry Fair (Nanjing) and the 2004 VIV China show.

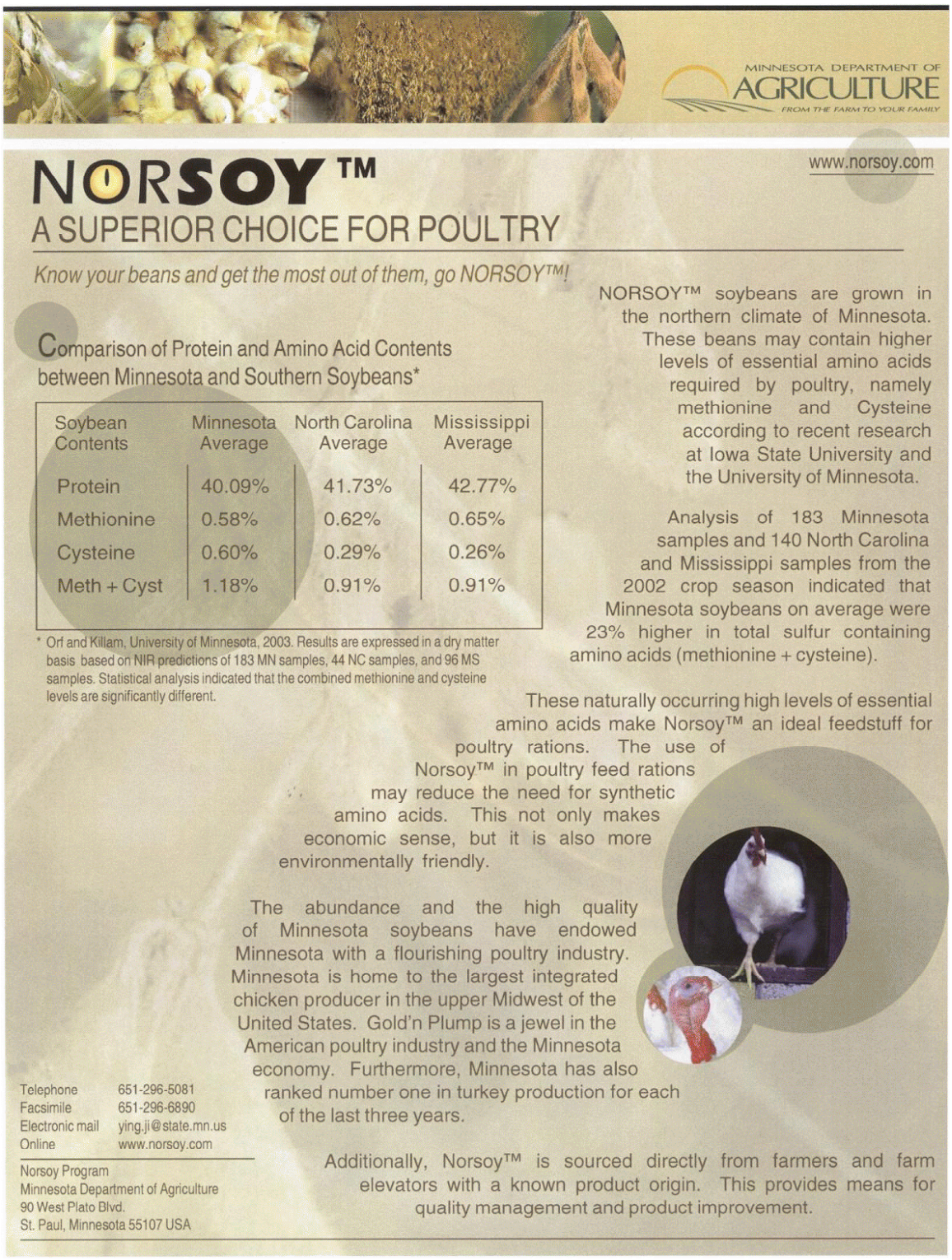

Figure 7. Norsoy™ Fact Sheet Design

Similarly a Norsoy banner has been developed as in the background picture of Figure 13.

2.2.2. Objective 2b: Attendance and exhibition at trade shows.

The Minnesota Department of Agriculture has been working with the State of Jalisco, Mexico through the Jalisco Ag Council. Jalisco has the highest concentration of poultry producers in Mexico. The Jalisco poultry industry has expressed a keen interest in our corn and soybeans, especially in a direct purchase/marketing arrangement for a known origin in Minnesota.

Minnesota Department of Agriculture staff, Craig Damstrom, Agricultural Trade Consultant, has visited Mexico several times in the last two years. His visits have facilitated information exchange and promotion of Norsoy™ and the Norsoy™ program and the organization of future activities in the promotion of Norsoy™ and other Minnesota agricultural products. As a result, Mr. Ricardo Stettner has been retained on the staff of Jalisco Ag Council to coordinate related trade activities. Mr. Stettner visited Minnesota in January 2003. The purpose of his visit included 1) planning of Norsoy™ information access, Norsoy™ product specification and quality program and logistical and marketing plan, and 2) visiting of selected Minnesota farmers and elevator operations. During his stay in Minnesota, Mr. Stettner also visited Glacial Plains Grain Elevator in Murdock, Benson Ethanol Plant, the Minnesota Grain and Feed Association, the Trade Acceptance Group with specialization on export credit, and the Minnesota Grain Inspection, a division of the Minnesota Department of Agriculture.

We have also hosted the Minister of Agriculture from Manzanillo, Mexico. Manzanillo is a coastal city near Guadalajara. St. Paul and Manzanillo are forming a sister city relationship. A significant end-user of soybeans in the State of Jalisco, Alicsa, has recently contacted us with strong interest in switching from their current commodity of choice, Canola, to Norsoy™ soybeans. Julio Gomez Sr. and Julio Gomez Jr., owners of Alicsa and members of the Jalisco Ag Council, are very interested in the potential features of Norsoy™ soybeans. They are interested in selecting soybeans with favorable constituents for their poultry feed manufacturing. In March we hosted their visit to Minnesota and discussed possibilities of collaboration in the promotion and facilitation of Norsoy™ trade in Mexico. We also discussed the feasibility of processing Norsoy™ soybean in Mexico as a way to retain the nutrient integrity of Norsoy™ nutritional composition.

In collaboration with the Jalisco Ag Council, we sponsored a Norproducts conference on June 20, 2003 at which Norsoy™ information was systemically displayed and disseminated. Commissioner Gene Hugoson, Agricultural Marketing Services Division Director, Kurt Markham and other staff of the Minnesota Department of Agriculture along with the staff of the Minnesota Shippers Association attended and facilitated the conference. The Jalisco Ag Council indicated that there are presently several buyers in Mexico interested in purchasing Norsoy™ soybeans and they requested that solid quotes on Norsoy soybeans be available at the show. Prior to the Norproducts Conference, MSA shipped individual samples of Norsoy to Guadalajara for distribution among the attendees, of which were industry nutritionists. One buyer in particular is close to

securing a 20 million dollar line of credit through the U.S. Ex-Im Bank in preparation for purchase of Norsoy™ products, among other things.

A train of 25 car soybean was sold to Mexico in January. Other than a couple of minor transaction related issues, the customer in Mexico is very happy with the product they received. It is intended and the customer would like to make this shipment on a monthly basis, perhaps with greater units of 50 car trains.

We also participated and exhibited at the 2003 ASA Japan Show in Tokyo, Japan on July 9 and 10, 2003. This seminar and trade show was an excellent opportunity to promote MN agriculture in partnership with the Minnesota Crop Improvement Association, the MN Soybean Growers and the University of Minnesota. We promoted high-amino acid soybeans at this show.

Figure 8. Exhibit at the 2003 ASA Tokyo Show.

MSA also attended the SE Asia Soy Seminar in Bangkok, Thailand on July 3-4. MSA gave a presentation detailing MN's agricultural products and MSA's role as a facilitator of trade. SE Asia is an emerging market for specialty soybeans. MSA will also promote high-amino acid soybeans at this show.

U.S. Grain Council Annual Meeting was another successful event where Norsoy™ was promoted.

Figure 9. MDA Staff (2nd from Left) Hosting a Chinese Delegation at the US Grains Council Conference

This Conference was well attended by major grain importer from every region of the world. Specific attention was given to the delegations from both China and Mexico.

Northern Crops Institute (NCI) Importers Seminar: MSA has lectured to NCI importer classes on the advantages of high amino-acid Norsoy™ Soybeans for Poultry rations.

In 2002, we attended VIV 2002, a feed and animal husbandry supply tradeshow in Beijing, China. We have since developed a relationship with the purchasing director of FoodChina, a web-based agricultural trade group that was founded by various agricultural companies including the China Cereals, Oils and Foodstuffs Import & Export Corporation (COFCO, the Chinese government monopoly), Cargill and ADM, just to name a few. FoodChina not only has markets in China but also in South East Asia.

In January of 2003, MDA staff Dr. Richard Ying Ji visited the purchasing manager of COFCO Shanghai, Mr. Lin Gang. We exchanged information on the businesses and programs of interest. Mr. Lin is very interested in the Norsoy™ program we are establishing and we planned future cooperation in linking soybean users in China and producers in the U.S.

We also hosted Dr. Li Defa in conjunction with the University of Minnesota. Dr. Li is the director of the Feed Industry Center of the Chinese Agricultural Ministry at the China Agricultural University in Beijing, China. Dr. Jerold Shurson has been working with Dr. Li in the field of animal nutrition.

BDH Group is one of the largest, if not the largest state owned agricultural enterprises in China. Their businesses range from growing of various crops to agricultural processing of all commodities and agricultural products. Their annual need of imported soybeans is stated at 1,000,000 metric tons. We hosted their visit to Minnesota on September 10-12, 2003. We introduced them to various aspects of Minnesota Agriculture and had them meet a farmer cooperative that is engaged in agricultural commodities trade, the CHS cooperative. They became very fascinated and interested in our farmer cooperative structure for they felt this may be one of the mechanisms for reforming the Chinese agricultural ownership and operations for agricultural processing.

Figure 10. Chinese BDH Group visit to Minnesota

In November 2003, Richard

Ying Ji made a reciprocal visit to the BDH Group. In addition to learning and understanding the core businesses and their future plans of BDH Group, emphasis was given to their oil crushing operation, Jiusan Oil and Refinery.

Figure 11. Visit at Jiusan Oil Refinery

Jiusan which is one of the premier cooking oil brands in China. In addition to their crushing facilities in the Helongjiang Province, they are also constructing two major facilities in Dalian and Tianjing. The facility in Dalian is right next to the Beiliang Elevator at the port city of Dalian. With these two facilities completed, they will have a need for soybeans of 2 million metric tons a year with half of that depended on import. In addition they are one of the major suppliers of malting barley in the Northeast China. They need 100,000 metric tons of imported barley a year.

In November last year the 2003 China Animal Husbandry and Feed Industry Trade Fair was held in Nanjing, China. Department staff, Dr. Richard Ying Ji attended the show and visited various entities related to poultry feed operations in China. The trade fair was attended by thousands of people with over 1,000 exhibitors occupying 15,300 square meters on two floors. It is one of the largest, if not the largest such show in China. Valuable contacts were made at the show that included a brief exhibit of the Norsoy™ popup display at the Ministry of Agriculture Feed Industry Center booth while Richard was visiting with to Dr. Defa Li of the center director. Another valuable contact made was with the Feed Research Institute of the Chinese Academy of Agricultural Sciences.

Figure 12. 2003 China Animal Husbandry and Feed Industry Trade Fair

Both of these institutions are in a good position to conduct poultry feed and nutrition work. Possibilities of future collaboration were discussed with Dr. Li at the show.

Dr. Huiyi Cai (center in Figure 14) is the Director of the Feed Research Institute. Contact with him was just made at the Trade Fair. He is very

Figure 13. Visiting with Dr. Li

Figure 14. With the Feed Research Institute Crew at the ADM Booth

interested in the concept of Norsoy™ and any future collaboration opportunities.

In conjunction with the trade show, Dr. Ji visited many other agricultural/feed operations. East Hope is one of them. Two of the East Hope Executives attended the Grain Council's Grain Conference held in Minneapolis in July 2003. East Hope was identified as the most prominent for promoting Northern soybeans amongst the Chinese attendees at the Grain Conference.

Hope Group is one of the largest feed manufacturers in China. The Liu brothers, the owners of Hope Group, occupied the number one spot in the 2001 Forbes Fortune 500 list in China with over 140 feed mills throughout China. East Hope is the largest of the Hope Group companies. The Liu brothers broke up the original Hope Group in 1995 and separated into individual Hope companies. Liu Yongxing, Chairman of then Hope Group started the East Hope with his shares and moved his operations to Pudong, Shanghai in 2001. East Hope is now mainly engaged in feed and aluminum businesses.

Figure 15. Visiting East Hope in Beijing and Shaighai

Beijing Company of East Hope is the largest and the most profitable of East Hope companies. It comprises three manufacturing plants in the suburbs of Beijing area. It is headquartered in the Caoyang District of Beijing on the 4th Ring Road. The

other two plants are located in Huairou and Fangshan. The total production of the three plants is between 100,000 and 150,000 metric tons a year. There are a total of 29 feed companies like Beijing Company within East Hope.

Currently, all East Hope feed mills procures their macronutrients individually from the local market. Mr. Yang, General Manager of Beijing Company said that East Hope should consider centralizing the imported portion of the macro ingredient supply to ease the pressure of local purchase.

Liuhe is another successful story of privately held Chinese agricultural enterprises. Its main business is in the integrated poultry businesses including feed manufacturing, breeding, animal husbandry, animal health, biotech development as well as international trade. "We will be very interested in the import of all kind of agricultural commodities from soybean meal, to corn, to wheat," said Mr. Lu, Weiming, Vice President in Charge of animal nutrition, "simply because of our bottom line depends on it. Liuhe is located at one of China's port cities, Qingdao. It will have its advantages in utilizing imported feed ingredients. Mr. McKinnon of the ASA's Beijing office said that Liuhe is one of the most progressive feed companies in China. Their decisions on feed and nutrition are the most science based." Mr McKinnon felt that Liuhe would be most likely to take advantages of the better amino acid composition of Norsoy™ soybeans. A visit to Liuhe was not possible because of time constraints during the trip. Only initial contacts were made with Liuhe.

The National Poultry Institute is located about 120 kilometers east of Nanjing, China. It appeared it might be a good institution for poultry feed testing. While it does have some facility for conducting feed and nutrition research as well as food processing, its strength amongst its peers in China is in poultry genetics. It has the largest collection of poultry seedlings in China.

Figure 16. National Poultry Institute

K.C. Hor of Kuok Oils & Grains Pte Ltd, one of major Asian soybean buyers, visited Minnesota and the Red River Valley from December 2 through 5, 2003. Kuok Oils and Grains owns a crushing plant in Malaysia and two in China. K.C. is responsible for purchase of soybeans for all the Kuoks crushing plants and other beans that they trade into the South East Asia. The three plants consume about 1.5 million metric tons of soybeans a year.

Together with the Minnesota Shippers Association, we facilitated Mr. Hor's visits to various soybean processing and marketing organizations including Minn-Kota Ag

Products, Northern Crops Institute, Richland Organics, Circle C Seed Processors, and Tobolt Seed.

We also facilitated Mr. Hor's visit to Takoma Export Marketing Company (TEMCO), a joint venture between Cargill and CHS at the headquarters of CHS in Inver Grove Heights. TEMCO had just sold a shipload of soybeans to Mr. Hor and they were being loaded in Tacoma, WA on the weekend of Dec. 6, 2003. The load was originated from CHS of mostly Minnesota beans.

Fig. 17. Mr. Hor at the North Dakoda Ag Expo

Figure 18. Mr. Hor's Visit to CHS

In May 2004, we made the debut of Norsoy™ exhibit in China. We exhibited at the 2004 China (Nanjing) Animal Husbandry, Aquaculture and Feed Industry Show. It was a regional event. We were given a prime center location right at the front entrance. The show goers were genuinely interested in the Norsoy™ concept and the concept of direct supply from American farmers. We also gathered a few ideas on changes to our exhibit for the VIV China show in September in Shanghai.

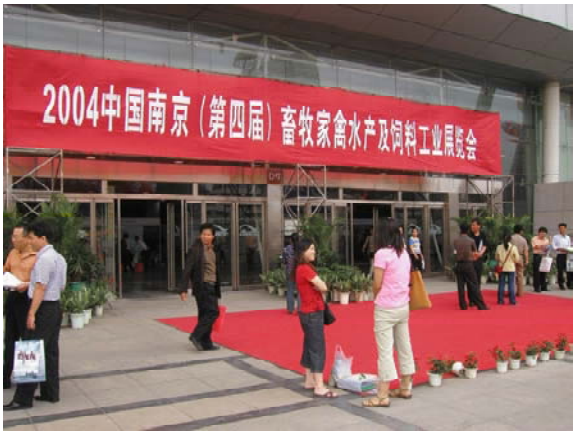

Fig. 19. 2004 China (Nanjing) Animal Husbandry, Aquaculture and Feed Indsutry Show

In conjunction with the feed industry exhibit, we also visited a feed manufacturer and two oil curshers. Tianchen Feed is located in Haian, Nantong City. Haian prides itself as the supplier of ¼ of Shanghai's egg supply. Tianchen is a major supplier of that poultry production in the area.

The initial focus of Norsoy™ promotion is on poultry feed manufacturers because of their potential interests the amino acid profiles. However, in the material flow, the crushers, not feed manufacturers make purchases of soybeans. are direct soybean buyers. Feed industry may help demand Norsoy™, but we ultimately have to work with the direct soybean users, the crushers. For that reason, Richard visited two oil crushers, Baogang Oils and Fats Development Co. and Tianfa Group Co.

Fig. 20. Tianchen Feed Company

Baogang is one of the major crushing facilities on the China's east coast. It is located right at the port of Nantong. The bulk of the facility is storage space for both beans as their raw material and finished products, namely the soybean meal. They are consuming about three shiploads of soybeans every two weeks. Nantong is a major production area of poultry and pork. It is a main supplier of meat and poultry for Shanghai and the greater Yangtze Delta area which provides the best economy in China. (The only area that may be similar to it is the Pearl River Delta next to Hong Kong.)

Currently Baogang is buying their beans from all the big dealers out of Shanghai. They might be in a good position to become one of our customers. Between Tianchen's feed supply to the prime poultry production in China and Baogang's crushing operation in the area, there might exist a great potential for Norsoy™.

Tianfa Group Co. is located in Jinzhou, Hubei Province in Central China. Tianfa is currently one of the Fortune 500 companies in China. Two of its subsidiaries, Tianfa Petro and Tianyi Science are publicly traded companies. Its agricultural processing includes rice processing, oil crushing, feed manufacturing and many other processing and animal husbandry operations. Tianfa got its start in the LP gas distribution business. Its main source of revenues is from its petrol business. It is the only company in the petroleum business other than the two state owned monopolies of PetroChina and Sinopec. It focuses its crushing operation mainly on canola. Hubei is one of the major canola producing areas in China. They own their own oil brand, Tianyi. Right now they purchase small quantities of soybean oil to mix and maintain their brand of salad oil. They are contemplating getting into soybean crushing to satisfy their own blending needs. Pictures shows their headquarters, the rice processing, feed manufacturing, oil

crushing facilities. Whether or not they will be a soybean crusher in the near future, they are well positioned to be an important player in the post COFCO monopoly era after China fully joins the World Trade Organization.

Fig. 21. Ooverlook of Tianfa Agricultural Processing Operations

Exhibit at the VIV China show in Shanghai was a huge success. A small delegation consisting of Perry Aasness, Assistant Commissioner of MDA; Kurt Markham, Director of MDA Agricultural Marketing Services, Robin Hanks, Treasurer of Minnesota Soybean Research and Promotion Council and Richard Ying Ji .

The show occupied 7,800 square meters (approximately 75,000 square feet) and attracted 17,268 registered visitors, 11% of them came from outside of China. It was the largest exhibit in the areas of animal husbandry and feed industries in China.

The Norsoy™ booth was visited by hundreds of visitors and 278 left their business cards. These business cards came from a total of 19 countries over three days of exhibit. Norsoy™ information in particular and Minnesota agriculture in general were exhibited at the show. Both staff from the American Soybean Association office in

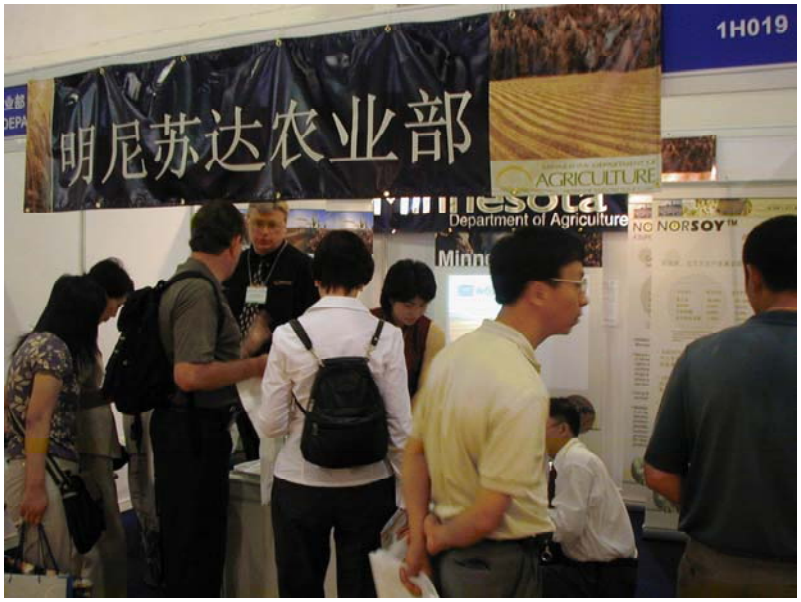

Fig. 22. Norsogy™ Exhibit at VIV China Show

Beijing and FAS Office in Shanghai came and visited with us.

Mr. Ross Kreamer of the ATO Office in Shanghai passed a lead to us that Shanghai Hankang Soy Products Company was interested in using American soybeans as an alternative source for their soybean needs. After the exhibit, Richard followed up with a visit to the company. The owner of the company, Mr. Zhou Hankang, is interested in having a supply of quality soybeans with relatively stable pricing. Mr. Zhou started the company in 1991. It currently has over 40 soy products with access to over 220 retail stores which covers over 80% of the Shanghai soy products market. Over 120 of those retail stores are specialty stores that sell solely his soy products. He uses about 7,000 metric tons of soybeans a year.

Fig. 23. Shanghai Hankang Soy Products Company

During the trade show, part of the Minnesota delegation also visited a major poultry concern in Shanghai, Dajiang Group Company. Dajiang is a publicly traded, vertically integrated company. It had sales of $145 million last year with $25 million exports, mainly to Japan. Its operations include poultry breeding, farming, feed manufacturing and meat processing and biopharmaceutical production, among other things.

On Friday, September 10, 2004 we also visited ASA office in Beijing and met with both Mr. Phil Laney, ASA China Director, and Mr. Xiaoping Zhang, Deputy Director. Mr. Laney said that the market was disrupted after 30 buyers defaulted when Chinese government rejected 12 contracts of soybeans supposedly because of pesticide contamination. These contracts were entered when soybean prices were at its highest. China is no longer issuing importing licenses on soybeans pursuant to WTO trading rules, however they are using quarantine rules to control the import of commodities. GIS and APHIS functions are combined in one office in China and Degree 73 improved on the time period allowed on import permits, but codified quarantine regulations and stipulated their strict observation.

Fig. 24. ASA Beijing Office

ASA shared with us the dissatisfaction of soybean buyers with the quality of soybeans delivered by grain companies. Buyers don't feel they are getting quality and would like to buy direct and bypass big grain companies. Currently no identity preserved market for food grade soybeans exist in China.

2.2.3. Objective 2c: Trade oriented exchange missions.

Funding in the current grant does not include this sub-objective. Work in this sub-objective has not begun yet.

2.3. Objective 3: Information Dissemination of Amino Acid Based Feed Formulation and Norsoy Advantage.

We have started this objective at the NorProducts Conference in Jalisco, Mexico. University researchers such as Dr. Jerry Shurson have participated in the dialogue with feed manufacturers' nutritionists on Norsoy™ nutrition.

2.3. Objective 4: Web Based Direct Marketing.

Information on our targeted market has been collected and related marketing materials on northern soybeans have been developed. Norsoy.com (www.norsoy.com) had been established. However, we have run into a registration slack. Norsoy.com was registered outside of MDA's information services, as a result was not compliant with the department policies. As the issue was being sorted out, the registration expired. The information fro Norsoy.com is being converted to be a part of MDA's website.

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